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ABSTRACT

Immigration and domestic industrial policies have been powerful instruments in the creation of immigrant "niches" in labor markets. While Indians have clustered in the information technology industry, Mexicans have formed niches in low-skilled industries such as agriculture. A review of the relationship between immigration policy and the requirements of the information technology industry reveals two important conclusions. First, immigration policy changes of the mid-1960s facilitated the immigration of Indians with high levels of education. Asians and Africans could not use family reunification to enter the United States, so the only path open to them was the use of occupational skills. This explains why these immigrants are so highly educated and why they concentrate in high-tech industries. On the other hand, Mexican immigrants constitute the largest group of unskilled workers because economic and social costs of immigration are lessened by geographical propinquity. In addition, specific U.S. immigration policies, direct recruitment, and the development of social networks have encouraged the immigration of unskilled workers. The departure of IBM from India in 1978, and the failure of the country to develop a domestic viable computer industry forced most Indian users to rely on imports. Thus, during the 1970s and 1980s Indian programmers learned how to work on a variety of platforms. In contrast, Mexico has solidified its role as the preferred location for the electronics manufacturing industry. (Contains 33 references.) (TD)

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Migrants of the Information Age: Indian and Mexican Engineers and Regional Development in Silicon Valley

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El Colegio de la Frontera Norte

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Migrants of the Information Age: Indian and Mexican Engineers and Regional Development in Silicon Valley

Rafael Alarcón

Introduction

Skilled migrants are less restricted than unskilled migrants to participate in U.S. labor markets. Immigration policy, corporate power and their own class resources allow them to cross borders with greater ease than low skilled migrants. This privileged position stems from the fact that these professionals seem to be vital to corporations that are involved in global production processes and markets. Many of the foreign-born engineers and scientists working in the United States are employed in the information technology industry.

There are four main avenues through which highly skilled migrants coming from developing countries find employment in high technology companies. Some of them entered the United States as children of immigrant families. Others were former employees of subsidiaries of U.S. high tech companies located abroad. Another group is composed of former foreign students at U.S universities, and, finally the "Cerebreros" or "high tech Braceros" work in the United States with temporary visas. (Alarcón, 2000). Research consistently show that educational attainment among immigrants is much higher than among native-born engineers and scientists employed in the information technology industry (Alarcón, 1999: Bouvier and Martin, 1995).

In this article, I examine the role that U.S. immigration policy has played in fostering the development of the high technology industry by facilitating the temporary and permanent movement of foreign-born engineers and scientists into the United States. To this end, in the first part of the article, I examine the impact of the Immigration and Nationality Act of 1990. In the second and third sections, I compare the experiences of migrants from India and Mexico with respect to the formation of "niches" in the high tech industry. I analyze the combination of US immigration policy and the domestic industrial policies implemented in both countries in regards to the development of the information technology

industry.

The Immigration Act of 1990 and the Labor Requirements of High Technology

Since 1952 when Congress passed the Immigration and Nationality Act, legal immigration to the United States has been based on two cornerstones: family reunification and occupational qualifications. The INA basically continued the national origins system of the 1920s but also made major changes. The novelty was that INA made all races eligible for naturalization. The act also established a preference system that basically subsists today which favors family reunification. It granted first preference to the immediate relatives of U.S. citizens and legal residents. Skilled and unskilled workers in certain occupational categories were also eligible to enter the United States (Immigration and Naturalization Service, 1991, A.1-6: Calavita, 1994).

In the mid-1960s there was a major revolution in U.S. immigration policy. In 1965, the INA was substantially amended in key provisions under the pressure of the civil rights movement. The new act abolished the national origins quota system established in the 1920s, eliminating national origin, race or ancestry as a basis for immigration to the United States. This led to a more diversified pool of immigrants from regions in the world other than Europe. However, the 1965 Immigration and Nationality Act (also known as the Hart-Celler Act) maintained the principle of numerical restriction, limiting Eastern Hemisphere immigration to 170,000 and placing for the first time a ceiling on Western Hemisphere immigration of 120,000. This legislation also set a per country limit of 20,000. The act also established a seven-category preference system for relatives of U.S. citizens and permanent residents to reunify families and for persons with special occupational skills to meet labor market needs in the United States. In the end, neither the preference system nor the per-country limit was applied to the Western Hemisphere (Immigration and Naturalization Service, 1992).[1]

Current immigration flows have also been shaped by the less discriminatory Refugee Act of 1980 and the Immigration Reform and Control Act of 1986 (IRCA) that contained three principal measures: an amnesty for undocumented workers already residing in the United States, (2) sanctions against employers who knowingly hire undocumented workers, and (3) increased enforcement at U.S. borders.

In 1990 the U.S. Congress addressed the question about the human capital of the immigrants and its consequences for the global competitiveness of the United States by favoring the immigration of professionals and by emphasizing the skills of new immigrants. In this sense, the Immigration Act of 1990 follows a trend marked by other developed countries like Canada and Australia which have adopted a visa allocation system toward skill requirements rather than family reunification. In both countries a point system is in place and potential immigrants are awarded points according to their levels of education, age and occupational skills (Kanajapan, 1995).

The Immigration Act of 1990 expanded significantly the proportion of employment-based visas increasing their number from 54,000 under previous immigration law to 140,000 per year. Before 1990, less than 10 percent of the immigrants could enter the U.S. each year based on their job skills. Thanks to

[1] The third preference granted 27,000 visas per year to attract foreign-born professionals of exceptional ability, their spouses and children. The sixth preference provided another 27,000 visas per year for skilled and unskilled immigrants and their spouses and children in occupations in which workers were in short supply in the United States. The immediate relatives of U.S citizens and some special immigrants such as certain ministers of religion and former employees of the U.S. government abroad were not subject to numerical restrictions.

the Immigration Act of 1990, approximately 21 percent of the new immigrants each year are now admitted because of their occupational skills. As shown in table 1 the 140,000 employment-based visas granted to the principal immigrants and their families were allocated under a system of five preferences that encourage the immigration of university professors, artists, athletes, religious workers, investors and engineers and scientists.

The Immigration and Nationality Act of 1990 also continued the long standing tradition of not restricting how many immediate relatives of U.S. citizens can enter the United States each year (spouses, children and parents of U.S. citizens). In this sense, the act allocated 480,000 visas for family reunification purposes, giving unlimited access to the immediate relatives of U.S. citizens and then granting the remaining visas under a system of four preferences benefiting the adult children of U.S. citizens and the direct relatives of permanent residents (see table 1).

In response to the fact that the Immigration Act of 1965 favored immigration from Asia and Latin America, Congress wanted to promote diversity among other immigrant groups. For this reason, Congress allocated 55,000 visas to natives of low-admission countries. While Irish immigrants are the main beneficiaries of this measure, natives of twelve high-admission countries including Canada, Mexico, El Salvador, India, China, and the United Kingdom are ineligible for this program. Table 1 describes the content of the Immigration Act of 1990.

Table 1 Immigrant Categories of the Immigration Act of 1990

Family – Sponsored Immigrants		**480,000**
1.- Adult Unmarried Children of U.S Citizens	23,400	
2.- 2A Spouses and Minor Children of Permanent Residents	114,200	
2B Adult Children of Permanent Residents		
3.- Married Children of U.S. Citizens	23,400	
4.- Brothers and Sisters of Adult U.S. Citizens	65,000	
Total (Family Preference Floor)	226,000	
Employment - Based Immigrants		**140,000**
1.- Priority Workers	40,000	
2.- Immigrants with Advanced Degrees	40,000	
3.- Skilled and Unskilled Workers	40,000	
4.- Special Immigrants	10,000	
5.- Investors	10,000	
Diversity Immigrants		**55,000**

Total (overall immigration cap)		**675,000**

Source: Table constructed from (Yale-Loehr, 1991)

Priority Workers are immigrants with extraordinary ability in the sciences, arts, education, business, or athletics as well as outstanding professors and researchers and certain executives and managers of multinational corporations. They are not required to obtain labor certification to obtain these visas. The second category includes immigrants with advanced degrees or with exceptional ability in the sciences, arts or business. In order to obtain the visas they need to show a concrete offer of employment and labor certification. The third category is designed for skilled and unskilled workers and requires a job offer and labor certification. Only 10,000 visas are available to unskilled workers. The Special Immigrants are certain religious ministers and workers and overseas employees of the U.S. government. Finally, the fifth category allocates 10,000 visas for investors who establish a new commercial enterprise and invest between $500,000 and three million dollars in the United States. The investment must create at least ten full-time jobs for U.S. workers (Calavita, 1994: Papademetriou, 1996; Yale-Loehr, 1991). Interestingly, Louie and Ong (1995) in their study of the early use of the investor visa by East Asian immigrants found lack of interest on the part of potential investors.

The Department of Labor requires information about wages and the availability of U.S. workers to confer the labor certification. The union representative of the company that is applying for an employment-based visa must be also notified and a notice about the labor certification application must be posted "in conspicuous locations" in the company.

Table 2 illustrates the impact of the Immigration Act of 1990. The table contains the countries that sent at least fifty percent of the immigrants who became permanent residents in 1994 through the use of employment preferences. Column 2 contains the number of persons admitted under one of the five employment preferences and column 3 shows the percentage of persons holding employment visas from the total number of visas granted to each particular country that year. The table shows that immigration from European countries and Canada is mainly composed of persons with employment visas. On the other hand, India and Mexico have a small percentage of persons with employment-based visas showing that family reunification has more importance in the migration streams of the two developing countries.

Table 2 Permanent Residents Admitted on Employment-Based Preferences in 1994

	Number	% of total Immigrat
China	13,107	56.8
The Philippines	9,620	40.7
India	8,431	38.5
Canada	7,070	83.4
United Kingdom	5,189	81.1
Korea	4,607	55.0
El Salvador	3,810	42.9
Mexico	3,663	24.3
Taiwan	3,627	54.3
Soviet Union	2,524	93.3

Total	123,291	

Source: INS, 1996

The Immigration and Nationality Act of 1990 also revised the non-immigrant visas, especially the H-1B non-immigrant visa that has been at the center of controversy over the alleged displacement of U.S. high tech professionals by the arrival of low-wage migrant engineers. This program is designed for temporary workers employed in "specialty occupations" that require highly specialized knowledge and at least a bachelor's degree or its equivalent.

There was originally an annual cap of 65,000 workers and H-1B visa holders were allowed to stay in the United States for a maximum of six years. However, as a result of a heated debate, the American Competitiveness Act which was approved in October of 1998 increased the number of H-1B visas by 142,500 over the 1999-2001 period. The annual ceiling on the number of H-1B visas issued are 115,000 in 1999 and 2000 and 107,500 in 2001. In the year 2002 the number of visas will return to the original quota of 65,000 per year (Migration News, 1998)

Currently, there are many immigration bills pending in both houses of Congress seeking to expand the H-1B program under the argument that the current annual limit of 115,000 H-1B visas fails to meet the information technology industry demand. Estimates of the high-tech labor shortage range from 300,000 to 800,000 workers (Valbrun, 2000).

The law requires employers wishing to hire H-1B workers to file a labor attestation with the Department of Labor, documenting wages, working conditions and the absence of a strike or lockout. (Yale-Loehr, 1991). High technology companies use this program with great frequency.

Table 3 shows the countries of origin of the H1-B visa holders who entered the United States in 1994. India is by far the most important contributor of H1-B workers. This underscores the importance of the temporary migration of software engineers and programmers from this country. The Philippines and Mexico are also two developing countries that send a large number of temporary skilled workers.

Table 3 Temporary Migrants with Specialty Occupations (H-1B Visa Holders) 1994

		%
India	16,948	16.0
United Kingdom	13,696	12.9
Japan	7,317	6.9
The Philippines	5,098	4.8
France	4,548	4.3
Germany	4,042	3.8
Canada	3,527	3.3
Mexico	3,256	3.1
China	2,721	2.6
Australia	2,676	2.5
Brazil	2,354	2.2
Italy	2,107	2.0

Soviet Union	2,104	2.0
Netherlands	2,068	2.0
Israel	1,897	1.8
Other countries	31,540	29.8
Total	105,899	100.00

Source: Immigration and Naturalization Service, 1994.

Other non-immigrant visas included in the Immigration and Nationality Act of 1990 were treaty trader (E-1), treaty investor (E-2), intra-company transferee (L-1), business trainee (Q), professional nurses (H-1A), agricultural workers (H-2A), (J-1) exchange visitors and, aliens with extraordinary ability, athletes and entertainers (O and P).[2]

North (1995) contends that the presence of the large number of foreign-born engineers and scientists has reduced the pressure to make major reforms in K-12 science and engineering education and has eased, if not eliminated, the pressure to recruit women and minority members for science and engineering careers. On the other side, a coalition of very strange bedfellows emerged to oppose restrictions to the immigration of the highly skilled. This coalition ranged from the Clinton administration, the Democratic Party, high-tech companies, church groups, ethnic lobbies and the "growth wing" of the Republican Party.

Michael Maibach, government affairs director at Intel Corporation considering that fifty percent of Ph. Ds graduate students in electronics engineering at U.S. universities are foreign born, wants Congress to allow high tech companies continuous access to these individuals. "If America's universities educate the world's best and brightest, America's industry should have the ability to hire them. Let's staple a green card to engineering Ph. Ds" (Maibach, 1995). The CEOs of Silicon Valley maintain that their companies have unfilled vacancies for engineers, and that the immigrants on their staffs are necessary to create good jobs for U.S. workers. However, the Immigration and naturalization Service argues that most visas granted to immigrants on employment grounds, go to technicians with two years of training, not to persons with "extraordinary ability" or to "outstanding professors and researchers" (Migration News. March 1996 and April 1996).

Critics of the H-1B program contend that most H-1B workers are hired by temporary staffing agencies that lease them to U.S. employers. In fact, among the ten top firms that brought H-1B workers between October 1, 1997 and March 31, 1998 were many Indian "body-shopping" companies such as: Tata Consultancy Services and Tata Infotech. The following are the 10 companies and the number of H-1B workers they brought in the period under consideration: Mastech, 672; Tata Consultancy Services, 490; Sai Software Consultants, 224; Tata Infotech, 199; ComputerPeople, 184; Intel, 144; Comsys Technical Services and Syntel, 131 each; Quality Information Systems, 124; and Intelligroup, 116 (Migration News. 1998b).

[2] Most of the non-immigrant categories do not permit the spouses of the principal alien to work. In particular, the H-1B category and the L-1 category do not allow working spouses. Spouses of J-1 exchange visitors are allowed to work if they can establish that the alien has sufficient income without the working spouse's income. For some critics, this prohibition discriminates against women because the vast majority of the principal aliens are males (Miller, 1994: 28-31).

Evidently, the Immigration and Nationality Act of 1990 has shaped labor markets in the information technology industry by encouraging the temporary and permanent migration of highly educated persons. Engineers and scientists from Asia are coming in large numbers both as temporary migrants and as permanent residents. Is this purely the effect of demographics? Are there more engineers and scientists from India and China in the United States because these two countries have gigantic populations? I address these issues by examining the experience of migrants from Mexico and India.

U.S Immigration Policies toward Mexico and India

Indian and Mexican immigrants are different in most accounts. They cluster in different places in the United States, bring contrasted levels of human capital and enter distinct labor markets. This is in great part the result of specific immigration policies implemented by the United States.

Immigration Policy towards India: From Farmworkers to Engineers

Unlike Mexicans whose main destination is the United States, Indians have formed strong immigrant communities in many countries. According to Madhavan (1985), emigration from India has been a salient phenomenon since the eighteenth century, when small number of Indians migrated to nearby countries as Ceylon (now Sri Lanka), Malaya, and Burma. The major emigration movement took place after the abolition of slavery in the British territories in 1834. Indians were used to replace slaves by colonial planters producing sugar, coffee, tea and other raw materials in Fiji, the West Indies, and Mauritius and for the construction of the Uganda railway.

Indian migrants began to work agriculture in the United States at the turn of the century. The first relatively sizable influx of Indian immigrants occurred around 1907 when 1,072 migrants entered the United States. These early migrants came from the rural areas of Punjab and, to a lesser extent from Bengal, Gurat, and Uttar Pradesh. The vast majority of the immigrants from the Punjab were Sikhs. (Rogers, 1994). Most of these immigrants settled in the West Coast, primarily in California and worked in agriculture. Due to the absence of Indian women in California, some Indian males began courting Mexican immigrant women, angering the Mexican men in the process. Despite this opposition, there were some "Punjabi-Mexican" families in the Imperial Valley of California during the 1910s, such as those formed by Mola Singh and Carmen Barrientos, Rulia Singh and Valentina Alvarez, and Albert Joe and Alejandrina Cardenas (Leonard, 1992).

Indian immigrants encountered extreme hostility and became victims of the then widely prevalent anti-Asian sentiment in California. Responding to pressure from the Asiatic Exclusion League of San Francisco, U.S. immigration officials began, in the late 1908, to deny admission to Indians (Minocha, 1987). In 1917 immigration law completely prohibited Indians from entering the United States. The ban on Indian immigration to the United States between 1917 and 1946 left small male Indian communities in California's Sacramento and Imperial Valleys.

The second phase of Indian immigration started when new amendments to the U.S. immigration law in 1946, relaxed restrictions on the immigration of Asians in general and granted Indians an annual quota of 100. The same year, U.S. Congress dropped all legal discrimination against "natives of India." In great part these changes were the result of the active work of Indian American lobbyists. Between 1946 and 1965, nearly 6,000 Indian immigrants were admitted into the United States. An overwhelming majority

of these immigrants who reported having an occupation, were professional and technical workers (Minocha, 1984).

According to Madhavan (1985) since 1945 there have been important changes in the patterns of immigration from India: Nepal a neighboring country, became the most important destination. For this reason in 1981 there were 3.2 million Indians living in that country. Between 1945 and 1980, nearly 750,000 Indians moved permanently to developed countries, with the United Kingdom accounting for 44 percent of that inflow, the United States with 26 percent, Canada with 14 percent, Western Europe (excluded the United Kingdom) 11 percent, and Australia with 5 percent. Madavan (1985) believes that Indian migration to these developed countries was mainly due to changes in their immigration policies that emphasize skills rather than national origin as the major determinant of admission. Indian emigration to the United Kingdom was constrained by the passage of the Commonwealth Immigrant Acts of 1962 and 1971.

The third period of Indian immigration begins in 1965 with the enactment of the important reforms to the Immigration and Nationality Act that ended the national origins quota system. In this contemporary period, the number of Indian immigrants has increased dramatically and highly educated professionals have characterized the flow. During this period, the number of Indian immigrants increased rapidly from 582 admitted in 1965 to 21,562 who became permanent residents in 1981. Right after1965, most of the Indian applicants used employment visas to enter the United States. According to Minocha (1987) in 1971, professional technical and kindred workers comprised almost 91 percent of all Indians admitted that year. This situation changed over time. In the mid-1980s, a great majority (over 80 percent) of Indians were admitted under family preferences. In spite of this, India has remained a very important source of immigrants with professional expertise or technical qualifications for the United States. Of the total number of professional or highly skilled immigrants admitted to the United States from all countries of the world, India contributed with as much as 19.5 percent in the period 1971-1980 and a significant 13.4 percent in the period 1981-1990. These disproportionately high rates are striking because India's share in total immigration to the United States was much lower than this, at 3.8 per cent in the 1970s and 3.6 per cent in the 1980s.

During the 1970s many Indians migrated to Middle Eastern countries on a temporary basis. Malaysia, Singapore, and the East African countries became progressively less important as major destinations, due in part to restrictive immigration policies enforced by those countries. For instance, only professionals who were under contract and entrepreneurs with their dependents were admitted into Malaysia and Singapore (Madahavan, 1985).

Today most Indian immigrants in the United States are predominantly young and highly educated. Thus, they differ notably from their earlier counterparts who were mainly comprised of middle-aged illiterate male farmers from rural areas. There are also many that have become entrepreneurs. In most large cities Indian restaurants are the most visible sign of this, but Indians also own gas stations and hotels. According to Rogers, the fact that there are many Indians in the motel business who share the surname Patel has led to the community joke of "hotel, motel, Patel." Saxenian and Edulbehram (1998) have also found that Indian immigrants are the owners of important high technology companies in Silicon Valley.

Immigration from Mexico: From "Open Borders" to Increased Restriction to the Low Skilled

From the turn of the century to the Great Depression, the policies of the Mexican and the U.S.

governments were at odds. While the U.S. government promoted immigration, its Mexican counterpart tried to discourage it. During this period, an informal "open border" policy toward Mexico was implemented, as was an active process of recruitment. Mexico began to provide employers with a growing pool of both legal and illegal workers for farmwork, mining, and railroad maintenance in the United States. Particularly instrumental was the construction of railways in the United States that provided an incentive to recruit labor from Mexico. Labor recruiters, or *enganchadores*, were sent to the Central Plateau states in Mexico to hire workers for railroad construction (Cardoso 1980). The process of recruitment was so effective in promoting migration that after a few years several rural localities in the states of Central Western Mexico, where recruitment was especially intense, became the most important sending localitities of today.[3]

As a result of the exclusion of Asian immigration, the U.S. government implemented several immigration policies to further attract Mexican workers. The history of intentional lenience began with the exemption of Mexicans from the literacy test requirement of the 1917 Immigration Act (Bilateral Commission, 1989). Furthermore, between 1917 and 1922, the U.S. government unilaterally launched a guest-worker program to compensate for the labor shortages created by World War I.. Finally, Mexicans were also exempted from the National Origins Acts of 1921 and 1924.

During the Great Depression, approximately half a million Mexicans were deported from the United States including many U.S. citizens of Mexican descent. Jobs that remained were given to U.S. citizens, and economic relief was denied to Mexicans, who were repatriated voluntarily or by coercion. In response to this, the Lazaro Cárdenas administration (1934-1940) launched a powerful drive to attract Mexicans in the United States back to their home country through agrarian reform and expropriation of foreign investments.

However, the entry of the United States into World War II revitalized the massive recruitment of Mexican labor. In 1942 the governments of Mexico and the United States established a temporary-worker arrangement known as the Bracero Program, which lasted until 1964. To Ernesto Galarza (1977, 374), a scholar and a farm worker leader, "the Bracero system was a cover up of the government as the junior partner of agribusiness." Despite the efforts to attract Mexican braceros the U.S. government conducted "Operation Wetback" in the early 1950s, when once again many undocumented workers were deported to Mexico.

The Bracero program was dismantled unilaterally by the United States in 1964. By the end of the program, some 4.5 million contracts had been issued. During this period, people in Mexican rural communities, besides gaining experience in migrating to the United States and establishing contacts with employers, began to depend on income earned in this country. In 1965 the Mexican government implemented the Border Industrialization Program (BIP), now commonly known as the "maquiladora program." This program was designed to promote local economic development in border cities and to provide jobs for those Mexicans who could no longer be expected to work in the United States. The BIP allowed foreign and Mexican investors to import temporarily duty-free all the inputs, machinery, and replacement parts needed for assembly as long as they ensured their reexportation (Wilson 1992). Because, maquiladoras mostly employ young women, these plants have not played an important role in

[3] Central Western Mexico comprises the states of Aguascalientes, Colima, Guanajuato, Jalisco, Michoacan and Nayarit.

deterring illegal immigration, which draws heavily on pools of young males.

The legal migration of families began to rise in the mid-1960s, when former Braceros took advantage of the family reunification provisions of the 1965 Immigration and Nationality Act. Between 1961 and 1980, 1.1 million Mexicans immigrated legally to the United States, and another 1.6 million entered in the period from 1981 to 1990. In 1991, in great part due to the legalization process, nearly one more million Mexican migrants were admitted as legal residents (Immigration and Naturalization Service 1992).

Undocumented migration had begun to grow rapidly during the 1950s, as the demand for Bracero visas exceeded their supply. The best estimates suggest that 2.1 million undocumented aliens were included in the 1980 U.S. Census. Eight years later, after the legalization of IRCA was implemented, Woodrow and Passel (1990) found that 1.9 million undocumented immigrants (1.1 million from Mexico) were included in the June 1988 Current Population Survey.[4] Overall, IRCA legalized nearly three million Mexicans. Many of them began to bring their families with them. This explains the rapid growth of the Mexican communities in California during the 1980s.

President Carlos Salinas de Gortari in 1991 proposed the establishment of a North American Free Trade Agreement (NAFTA) that, among other things, would bring about a reduction of immigration from Mexico because in his words "Mexico prefers to export its products rather than its people." Congress narrowly approved NAFTA in November of 1993.

In regards to immigration patterns, the proximity between Mexico and the United States has allowed the development of a temporary pattern of migration in which unskilled males, usually young, have worked for a certain period of time or seasonally for a few years and then they usually return to Mexico. However, several studies have suggested that since the 1980s, migration from Mexico has become more permanent and heterogeneous in terms of settlement patterns, gender, legal status and employment experience (Cornelius, 1992). The long-running economic crisis in Mexico that began in the early 1980s has encouraged the migration of highly educated professionals.

This review of U.S. immigration policy explains in part why Indian and Mexican migrants coming from developing countries, have contrasting demographic and economic characteristics: According to the 1990 census, while 87 percent of Indian immigrants in the United States have a high school education and 65 percent a college degree; only 24 percent of Mexican immigrants have a high school education and 3.5 percent a college degree.

In terms of occupations, Indian immigrants were highly concentrated on specialty occupations in 1990. Some of these occupations include those of the engineers, mathematical and computer scientists, natural scientists, health professionals, teachers, social scientists, lawyers, artists, entertainers and athletes. One third of the Indian immigrants and only three percent of the Mexican immigrants 16 years or older had such occupations. As a result of all these differences, the annual median household income for the Indian immigrants was $48,320 and $21,926 for the Mexican immigrants (Portes and Rumbaut, 1996). Table 4 illustrates these trends by showing the occupations of Indian and Mexican immigrants who became permanent residents in 1994.

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[4] According to Woodrow and Passel (1990: 65) analysis of the 1980 Census results suggested that 20 percent to 40 percent of the undocumented immigrants residing permanently in the United States were not included in the Census, therefore a similar range may be reasonable for the Current Population Survey.

Table 4 Immigrants Admitted by Major Occupation Group and Country of Birth, 1994

	All Immig		Mexican		Indian	
Professional & Technical	67,286	8.4%	843	0.8%	6,202	17.8%
Executive, Administrative & Managerial	26,931	3.3%	428	0.4%	1,786	5.1%
Sales	13,024	1.6%	1,590	1.4%	386	1.1%
Administrative support	21,590	2.7%	1,438	1.3%	747	2.1%
Precision Production, Craft & Repair	24,518	3.0%	3,409	3.1%	192	0.5%
Operator, Fabricator & Laborer	67,486	8.4%	22,069	19.8%	155	0.4%
Farming, Forestry & Fishing	15,606	1.9%	4,738	4.3%	914	2.6%
Service	50,646	6.3%	7,167	6.4%	846	2.4%
No Occupation *	517,329	64.3%	69,716	62.6%	23,693	67.8%
Total	804,416	100.0%	111,398	100.0%	34,921	100.0%

Source INS 1996 (Table 31) * includes homemakers, students, unemployed , retired persons and others no reporting an occupation.

In addition to U. S. immigration policy, the domestic industrial policies implemented by the governments of India and Mexico in regards to the information technology industry have contributed to further differentiate these two groups.

Industrial Policies in India and Mexico and the Emigration of Engineers and Scientists

The governments of India and Mexico have implemented different industrial policies towards the development of the information technology industry in their respective countries. These polices have not only shaped the formation of dissimilar industrial systems but also very contrasting migration patterns among engineers and scientists of the two countries. This section on industrial policy in India and Mexico is a summary of Parthasarathy (2000) and Borja (1992), respectively.

Although the first computer arrived in India in 1955, the origins of a state policy on high technology started in 1963, when the Indian government decided to strengthen the technological base in electronics for national development and security reasons. Initially, policy making in the industry was dominated by the Defense Ministry, but it shifted to the scientific community between the early1960s and the late 1970s. While the Defense Ministry was keen on ensuring access to electronics and computers, as reflected in the permission granted to IBM to establish itself in 1963 on relatively liberal terms, the scientific community was more firmly committed to self-sufficiency and self-reliance. This commitment influenced policy making until the late 1970s.

As in the case of Mexico, IBM controlled the Indian computer market until the early 1970s. In this context, there was a significant attempt to produce software on a commercial basis when the company Electronics Corporation of India tried to develop medium and mini computers in the early 1970s. This company displaced IBM as the leading player in the domestic computer market in 1972.

In the early 1970s, the Department of Energy invited proposals for developing software for export. Three years later, the Indian government established the Santa Cruz Electronics Export Processing Zone (SEEPZ) in Bombay. In 1974 the government issued guidelines to export software provided there was no foreign collaboration involved. Tata Consultancy Services, a company located in Bombay was the first to export software under this scheme.

The Indian government began putting pressure on IBM to manufacture more systems locally for the domestic market and for export. IBM made some propositions in return. Among other things, the corporation wanted to retain 100 percent of the equity in its core installations. The equity issue proved non-negotiable and IBM abandoned India in 1978.

Pressure for change began to mount from users and producers. In response, the minicomputer policy of 1978 permitted the setting up of companies that would design and assemble computers without any foreign financial or technical collaboration. Despite some restrictions, four firms began producing microcomputers, incorporating advances in microprocessor technology. In November of 1984 a few days before Rajiv Gandhi took office as Prime Minister, a new policy was announced. The manufacture of mini and microcomputers was now open to any Indian manufacturer, except those with more than 40 percent foreign equity. All restrictions on production capacity were removed but the policy required manufacturers to indigenize the industry. The manufacture of mainframes continued to be reserved for the public sector for a few years.

Software exports using overseas computers with satellite data links was now permitted. Thanks to this measure, Texas Instruments could set up the first earth station in Bangalore. The National Computer Network was available for software exports and the import of computers for software export was permitted at a special low duty.

In 1986 the Indian government announced the Computer Software Export, Development and Training Policy that was meant to provide Indian firms, liberal access to the latest software and software tools so that they could enhance their international competitiveness. In the meantime, the production of microcomputers grew almost ten times from 3,400 in 1984-85 to 33,000 in 1987. Though international prices were two to three times lower than domestic prices, end-user prices fell rapidly.

Some time later the Software Technology Parks were established to further encourage software export. The Department of Energy provided the necessary infrastructure and firms in the parks were allowed to import all equipment without any duty or import license and foreign equity up to 100 percent was permitted. In return, there was an export obligation.

Finally in 1991, a more radical liberalization was implemented. It included a devaluation of the rupee to boost exports and improve the foreign exchange rate. State regulation of industrial activity was reduced. A more open attitude was adopted to foreign investments allowing 51 percent foreign equity, permitting the registering of foreign brands and trade marks and making technology transfer agreements easier. There was also liberalization of trade policies including lower tariffs and reduced controls on imports. As a result of all of this, the United States has become the most important buyer of Indian software. It is important to stress that the United States is the world's largest and most sophisticated software market.

The introduction of computer technology in Mexico took place in the late 1950's when the first

mainframe computer was installed at the national university (UNAM). Between the 1960s and the 1980s, the national demand for mainframe computers was met by imports of computers produced by U.S. multinationals. In this context, IBM soon took over the leading position.

In 1981 the Mexican government launched a program to create a national industry to locally produce micro, mini computers and peripherals including their parts and components. The ultimate goal was to create the basis for future technological autonomy. Of course, this was the time when the import substitution industrialization strategy was strongly supported by the Mexican government.

Although, the program was never fully implemented, during its four years of duration, the number of companies manufacturing micros, minis and peripherals grew substantially. Approximately two thirds of these firms were of Mexican capital. The other third included joint ventures in microcomputers (like those of Hewlett Packard and Apple) in which foreign capital owned up to 49 percent of equity and foreign companies producing mini computers that retained 100 percent of equity.

The performance of the high technology industry during the import substitution period shows very high rates of output growth but low investment rates. The main activity focused on assembling rather than local production of minicomputers. By international standards the Mexican industry produced computers at high prices with outdated technology.

The year 1985 marked the beginning of a new era. Between that year and 1990 three important decisions were made. First, the Mexican government authorized IBM's investment project in microcomputers under total ownership. As it is well known, IBM had had a worldwide policy of maintaining 100 percent ownership of its plants. A second important factor that directly affected the computer industry was the partial opening of trade in mid 1985 that increased export stimuli. Finally, during the Salinas administration, a presidential decree in 1990, officially eliminated the 1981 protectionist approach. A new policy was put in place to guarantee the adequate supply of computers (imported or locally produced) for the Mexican market at prevailing international prices.

Between 1985 and 1990, due to the rapid growth of the local demand for microcomputers, this sector became the leader. In this new realm, some Mexican companies performed very well. This is for instance the case of Printaform that in a short period of time became the market leader, relying on the strategy of importing cheap parts and components from East Asia and producing inexpensive computers for the domestic market. Printaform displaced such big enemies as Apple, IBM and Hewlett Packard.

A reduced group of multinationals (IBM, Digital Equipment, Hewlett Packard, NCR, Honeywell, Wang, and Tandem) continued producing mostly minicomputers for export. These companies imitated the strategy used by multinational corporations in the automobile industry by following the demands of the U.S. market.

According to Evans (1989) the cases of Compubur and Apple portray the contrasting experiences of multinational corporations operating in Mexico. Compubur entered into a successful joint venture with Burrougghs. In contrast, Apple de Mexico, a wholly owned subsidiary of the U.S. parent company never really took off. Borja (1992: 251) notes that there were some successful experiences in the development of collective projects between national firms and multinational corporations. For instance, local area networks (LANs) was developed by Micron and Digital Data and a monochrome monitor for export was produced by IBM and Grupo Zonda.

Some of the negative aspects of the protectionist period persisted such as the dependency on imported parts and a negative balance of trade. However, there was an improvement in prices and investment in research and development. Two university-based centers established linkages with high tech firms: the Center for Research on Semiconductors at the Instituto Politecnico Nacional and the Centro de Tecnologia Electronica e Informatica (CETEI) at the Universidad Nacional Autonoma de Mexico (UNAM).

This comparative view of industrial policy in India and Mexico yields interesting insights. The Indian and Mexican governments went from an import substitution strategy of industrialization to economic liberalization at about the same time. In the case of Mexico this process has been more radical. The two governments faced a consistent policy on the part of IBM and responded differently. The departure of IBM from India and the absence of a strong domestic computer industry forced India to rely on imports from many sources. As a result of this, Indian programmers were forced to acquire a very eclectic training that is crucial in today's global labor market for software production (Parthasarathy, 2000). During the 1980s, the city of Bangalore, "India's Silicon Valley" supplied in addition to software products, large numbers of highly skilled, low-wage software engineers and programmers who took jobs in the United States and other countries. Currently, it is estimated that there are nearly 140,000 Indian scientists working abroad (Stremlau, 1996). In contrast, the relative success of Mexico in creating a national industry to locally produce computers, is one factor that helps explain the relative small number of Mexican engineers and scientists who seek employment in the United States.

Conclusion

This article has shown that immigration policy has been a powerful instrument in the creation of immigrant "niches" in the labor markets. While Indians have clustered in the information technology industry, Mexicans have formed "niches" in low-skilled industries such as agriculture, The review of the relationship between immigration policy and the requirements of the information technology industry reveals two important conclusions. First, the changes on immigration policy of the mid-1960s instituted a selection process that facilitated the immigration of Indians with high levels of education. This is the main factor that explains why these immigrants are so highly educated and why they concentrate in the high technology industry. Portes and Rumbaut (1996) contend that unlike Europeans and some Latin Americans (such as the Mexicans), Asians and Africans could not use family reunification to enter the United States. There were few immigrants from those countries living in the United States; hence, the only path open to them was the use of occupational skills. For this reason, at least in the immediate period after the implementation of the act, most of the Indians who entered the United States using employment-based visas were highly educated. This initial movement created a strong network of highly educated Indian immigrants. That situation began to change as family reunification and refugee policy allowed the immigration of less skilled persons.

On the other hand, the Mexican immigrants constitute the largest group of unskilled workers because geographical propinquity has lessened the selection process by lowering the economic and social costs of immigration. In addition, specific immigration U.S. policies, direct recruitment, and the development of social networks have encouraged the immigration of unskilled workers.

In regards to the effect of industrial policies in India and Mexico, Parthasarathy (2000) contends that the ability of Indians to become "global software engineers" is the result of industrial policies implemented by the Indian government supporting the development of the software industry. The departure of IBM from India in 1978, and the failure of the country to develop a domestic viable computer industry forced most Indian users to rely on imports that came from many sources. Thus, during the 1970s and 1980s Indian programmers learned how to work on a variety of platforms without being tied to any single one Parthasarathy (2000). In contrast, Mexico has solidified its role as the preferred location for in-bond manufacturing in the electronics industry, and now expanding under NAFTA.

Clearly, immigrants from Indian and Mexico who reside in the United States, do not represent a cross-section of the societies of their countries of origin. The professionals among the Indians and the unskilled workers among the Mexicans are overepresented.

Immigration policy and to a certain extent domestic industrial policies have contributed to the specialization of immigrants from some countries on certain occupations. In fact, there are some immigration programs that are largely identified as "belonging" to certain nationalities. For instance, the H-1B program is widely identified as an "Indian program." The H-1A program that is designed to provide professional nurses for the United States on a temporary basis is considered as a program for female Filipino nurses. Finally, the H-2A program for temporary agricultural workers is a "Mexican program."

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